Timing of Percutaneous Cholecystostomy

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ABSTRACT

Objective: To investigate the effect of the timing of Percutaneous Cholecystostomy (PC) on morbidity and mortality.

Study Design: Comparative cross-sectional study.

Place and Duration of Study: Department of Gastroenterological Surgery, University of Health Sciences, Gulhane Training and Research Hospital, Ankara, Turkey from 2017 to 2020.

Methodology: The study included 61 patients with ASA 3-4 score, who were underwent PC during the study period. The patients were separated into two groups as Group 1 (n = 23); who underwent PC in the first 24 hours; and Group 2 (n = 38), who underwent PC at 24-96 hours. Morbidity and mortality rates were compared between the groups.

Results: Morbidity was observed in 2 (8.7%) patients in Group 1 and 6 (15.8%) in Group 2 (p = 0.698) with 30-day mortality in 3 (13.04%) patients in Group 1 and 8 (21.1%) in Group 2 (p = 0.730). In the cholangiographic studies, more choledochus stones were determined in Group 2 (p = 0.041). Length of stay in hospital was calculated as mean 10.35 ± 9.50 days in Group 1 and 20.03 ± 45.28 days in Group 2 (p = 0.003).

Conclusion: No statistically significant difference was found in the morbidity and mortality rates when PC was performed later. The length of stay in hospital was found to be shorter in patients applied with early PC.

Key Words: Percutaneous cholecystostomy, Acute cholecystitis, Cholecystectomy, Morbidity, Mortality, Calculous cholecystitis, Acalculous cholecystitis.

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INTRODUCTION

Acute cholecystitis (AC) is a commonly seen disease that can lead to empyema, gangrene, perforation, bile leakage, peritonitis, sepsis, and even death. The gold standard in treatment is surgery.¹ Laparoscopic cholecystectomy is a surgical method in current widespread use.²

Percutaneous cholecystectomy (PC) in patients with AC is indicated for elderly patients with multiple comorbidities (ASA >3), in intensive care patients with acalculous cholecystitis, and patients at high risk for surgery with calculous cholecystitis.

The procedure is associated with high morbidity (20-30%) and mortality rates (6-30%) in high-risk patients. PC is a technique first described in the 1970's by Elyaderany *et al.*, in the context of jaundice secondary to bile duct obstruction and cholelithiasis.³⁻⁵ PC has been used around the world for nearly 50 years.

However, there is no consensus in literature about the timing of PC. The timing of PC ranging from 6 hours to 77 days in various studies, due to contrasting local management practices. Several authors have suggested that early PC reduces length of hospital stay and halt progression of the inflammatory process.⁵

The question is, should the PC be performed at the time of first admission to the patient, or after 24-hour supportive treatment (conservative management by antibiotic therapy and supportive care)? Will there be a difference between the outcome of two methods? According to the hypothesis, late PC will increase sepsis, mortality, and morbidity; but this needs validation.

The aim of this study was to compare morbidity and mortality in patients undergoing early (first 24 hours, Group 1) or late (24-96 hours, Group 2) PC.

METHODOLOGY

The study was carried out in the General Surgery Department, Health Sciences University, Gülhane Training and Research Hospital, Ankara, Turkey. The study included 61 patients with ASA 3-4 score, who underwent PC between January 2017 and December 2020. Before PC, ultrasound was performed by radiology for all patients. Computed tomography was applied to required patients. Percutaneous cholecystostomy was performed by interventional radiology using Seldinger method in all patients with 8-F pigtail catheter.

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Patient records were analysed retrospectively electronically.

The diagnosis of AC was made based on physical examination findings, laboratory test values, and imaging methods. Patients with Grade 3, according to the Tokyo 2018 guidelines,⁶ were referred to the Infectious Diseases Department, where antibiotic treatment was administered together with fluid replacement and analgesia, then PC was carried out subsequently. The patients were separated into two groups as Group 1 (n =23) applied with PC in the first 24 hours after the onset of symptoms; and Group 2 (n =38) that underwent PC at 24-96 hours. The groups were compared in respect of age, gender, body mass index (BMI) values, morbidity and mortality rates, comorbidities, ultrasonography (USG), abdominal computed tomography (CT), magnetic resonance cholangiopancreatography (MRCP), endoscopic retrograde cholangiopancreatography (ERCP) results, length of stay in hospital, operation type, pathological results, and culture results.

Inclusion criteria were: age ranging from 18-99 years with diagnosis of acute cholecystitis, with ASA 3-4 score, who underwent PC at the study place.

Exclusion criteria were: patients aged <18 years, pregnant patients, underwent PC in the others hospital.

Data obtained in the study were analysed statistically using SPSS for Windows version 23.0 software (SPSS Inc., Chicago, IL, USA). Conformity of the data to normal distribution was assessed with the Shapiro-Wilk test. The Student's t-test was applied for the comparisons of groups, showing normal distribution; and the Mann-Whitney U-test to groups of data that did not show normal distribution. The relationships between groups of categorical data were examined with Pearson test or the Chi-square test. As descriptive statistics, Median and IQR (Interquartile range) values were presented for numerical variables, while number and % values were given for categorical variables. A value of $p < 0.05$ was accepted as statistically significant. Ethical approval for the study was granted by the Scientific Research Ethics Committee of the University.

RESULTS

Evaluation was made of a total of 61 patients, who underwent PC, comprising 34 (55.7%) males and 27 (44.3%) females with a median age (IQR) of 67 years and median BMI (IQR) of 25.7. Group 1 included 23 (37.7%) patients, and Group 2, 38 (62.3%) patients. The median (IQR) length of hospital stay was 10 days (median, 16.3 days). Morbidity was observed in 8 (13.1%) patients and mortality in 11 (18%). The comorbidities observed were diabetes at the highest rate (n = 34, 55.7%) and acute MI at the lowest rate (n = 3, 4.9%, Table I).

Morbidity was observed in 2 (8.7%) patients in Group 1 and in 6 (15.8%) patients in Group 2 ($p = 0.698$). Thirty day mortality was determined in 3 (13.04%) patients in Group 1, and in 8 (21.1%) in Group 2 ($p = 0.511$). In the cholangiographs done, more choledochus stones were determined in Group 2 ($p =$

0.041). The length of hospital stay was calculated as median (IQR) 7 days in Group 1 and as median (IQR) 12 days in Group 2 ($p = 0.003$). No statistically significant difference was determined between the groups in respect of age, BMI, number of elective operations, operation types, ERCP results, and comorbidities (Table II).

Table I: Distribution of general characteristics.

	n	%
Group I	23	37.70
Group II	38	62.30
Male	34	55.70
Female	27	44.30
Age M (IQR)	67(24)	
BMI M (IQR)	25.7(3.8)	
Length of hospital stay (hours) M (IQR)	10(8)	
Morbidity	8	13.10
Mortality	11	18.00
Comorbidities		
Diabetes mellitus	34	55.70
Hypertension	43	70.50
Chronic renal failure	5	8.20
Acute renal failure	6	9.80
Chronic obstructive pulmonary disease	8	13.10
Coronary artery disease	22	36.10
Acute myocardial infarction	3	4.90

SD: Standard deviation; M: Median.

In the patients, who underwent surgery in both groups, *E.coli* predominance was observed most in the cultures of the materials sent for examination, and chronic cholecystitis was observed most in the pathology examination results. Acute cholecystitis was determined most on USG and CT.

When morbidity and mortality were examined in the groups, in Group 1 a liver abscess was observed after the procedure in one patient, and re-drainage was applied because of hematoma in one patient. In the Group 2 patients, liver abscess was observed in one, and re-drainage was applied because of bile leakage in three patients, hematoma in one and abscess in one. Mortality developed because of cardiac arrest in one patient and sepsis in two patients in Group 1. In Group 2, four patients died because of sepsis, two respiratory failure, one pneumonia, and one because of COVID-19 pneumonia.

DISCUSSION

In this study, patients, who underwent PC in the first 24 hours (Group 1, early) were compared with patients with PC at 24-72 hours (Group 2, late) in respect of morbidity and mortality. Although the morbidity ($p = 0.698$) and mortality ($p = 0.730$) rates were higher in the late PC group compared to the early group, the difference was not statistically significant. In addition, early PC significantly reduced the length of stay in hospital ($p = 0.003$).

The current gold standard in the treatment of acute cholecystitis is cholecystectomy. However, there is a 5%-30% risk of mortality in early cholecystectomy in elderly critical ill patients at high risk.⁷

Table II: Comparison of the demographic and clinical characteristics of the cases in both groups.

	Group I		Group II		p
	n	%	n	%	
Gender					
Male	14	60.9	20	52.6	0.530
Female	9	39.1	18	47.4	
Morbidity	2	8.7	6	15.8	0.698
Mortality	3	13.04	8	21.1	0.511
Age M (IQR)	71(26)		66.5(26)		0.457
BMI M (IQR)	25.2(3.4)		26.5(5.9)		0.483
Length of hospital stay (hours) M (IQR)	7(4)		12(6)		0.003
Elective operation	9	39.1	9	23.7	0.200
Operation type					
LC	6	26.08	4	10.5	0.067
Open	3	13.04	1	2.6	
Conversion to open	0	0.0	4	10.5	
Cholangiograph					
Choledocus stone	1	4.3	10	26.3	0.041
Normal	1	4.3	4	10.5	
Not applied	21	91.3	24	63.2	
ERCP					
Papillotomy	1	4.3	10	26.3	0.089
Stent	1	4.3	2	5.3	
Not applied	21	91.3	26	68.4	
Comorbidities					
Diabetes mellitus	14	60.9	20	52.6	0.530
Hypertension	18	78	25	65.8	0.301
Chronic renal failure	2	8.7	3	7.9	0.912
Acute renal failure	2	8.7	4	10.5	0.816
Chronic obstructive pulmonary disease	1	4.3	7	18.4	0.115
Coronary artery disease	9	39.1	13	34.2	0.698
Acute myocardial infarction	0	0	3	7.9	0.167

SD: Standard deviation, M: Median. *p-value was obtained from exact and Pearson Chi-square tests. +p-value was obtained from Mann-Whitney U-test.

Therefore, PC can be used in high-risk patients as bridging treatment or as an alternative to surgery.⁸

The Tokyo Guidelines for the Management of Acute Cholecystitis (2018) classify AC in three grades as mild (Grade I), moderate (Grade II) or severe (Grade III). For patients with mild cholecystitis (Grade I), direct surgery is recommended as the treatment approach for low-risk patients (ASA 1-2), and for high-risk patients (ASA 3-4), first antibiotics and supportive treatment, then surgery. In cases with moderate cholecystitis (Grade II), antibiotic and supportive treatments are applied first; and if not successful, drainage is performed first then elective surgery subsequently. If the first step is successful, emergency surgery is performed in low-risk patients and elective surgery is recommended for high-risk patients. In cases with severe cholecystitis (Grade III), antibiotic and supportive treatments is first carried out. If there is no severe organ failure and/or negative predictive factors, emergency surgery is performed in experienced centres if the patient condition is good, but if performance is poor and the patient is not in an experienced centre, percutaneous drainage is carried out.⁶ Consistent with these guidelines, PC was performed in the Grade III AC patients in the current study.

The early PC has many advantages. Early PC prevents the formation of adhesions, severe fibrosis and the destruction of anatomical tissue planes. During gallbladder surgery, these changes can make the surgery very dangerous. PC

should be performed as soon as possible.^{5,9,10} There are only a few studies about timing of PC placement. Chok *et al.* suggested that PC should be performed after three to four intravenous antibiotic doses.¹¹

In a randomised, controlled study by Hatzidakis *et al.* AC patients, who underwent PC medical treatment, were compared with those undergoing without PC. As 87% of the high-risk AC patients showed a response to medical treatment in the first 3 days, it was recommended that the timing of PC should be kept at 72 hours or later.¹²

Chou *et al.* compared patients with PC done in the first 24 hours with those after 24 hours. The early performance of PC was shown to shorten the length of hospital stay and reduce procedure-related bleeding without increasing mortality.¹³ In the current study, early PC also shortened the length of stay in hospital, but no difference was determined between the groups in respect of bleeding related to the procedure.

Bickel *et al.* demonstrated that the early (first two days) performance of PC decreased the rates of conversion to open surgery, reporting that the open surgery rate of early PC was 8.3%, while it was 33.3% in PC done after three days.¹⁴

In a study by Zazour *et al.*, patients who underwent PC were separated into two groups as early (first 24 hours) and late (after 24 hours) and compared. No significant difference was

determined in respect of morbidity, and the mortality rates were not compared, but the rate of conversion to open surgery during cholecystectomy was found to be greater in patients late PC.¹⁵ In the current study, no significant difference was determined between the groups in respect of morbidity and mortality, but the length of stay in hospital was observed to be longer in the patients applied with late PC.

In several studies, 30-day mortality after PC has been reported to be in the range of 0%-25%.^{13,16} In the current study, the 30-day mortality rate was found to be 18% with no statistically significant difference between the groups.

In the randomised, multicentre, controlled Chocolate study, PC and LC were compared in high-risk patients. The morbidity rate of major complications of PC was found to be 65%.¹⁷

The most frequently observed PC related complications were drain dislodgment (range 7.2-29.6%), minor bleeding (range 2.4-7.2%), minor bile leak (range 1.1-10.4%) and tube blockage (range 0.6-7%).^{5,13,18-21}

In the current study, morbidity was observed in eight (13.1%) patients, bile fistula in three (4.91%), liver abscess in two (3.27%), hematoma in two (3.27%), and abscess in the gall bladder in one (1.6%), for which re-drainage was applied. No significant difference was determined between the groups.

The main study limitations remain the retrospective nature of the study and the limited number of patients, limiting the generalisation of these results.

CONCLUSION

There was no significant effect on morbidity or on 30-day mortality of early (<24 hours) or late (24-96 hours) performance of PC after starting medical treatment in patients with Grade III acute cholecystitis. However, PC applied early was seen to shorten the length of hospital stay.

ETHICAL APPROVAL:

Ethical approval for this study was granted by the Ethics Committee of University of Health Sciences, Gülhane Scientific Research Hospital (Decision No. 2020-457).

PATIENTS' CONSENT:

Written informed consents were obtained from all the patients.

CONFLICT OF INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

MAU: Conception, design, supervision, resource, materials, analysis, interpretation, data collection, advanced material processing (AMP), literature search and writing.

AD: Resource, materials, data collection and advanced material processing (AMP).

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